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THE PATENTS ACT, 1970

It is hereby certified that annexed hereto is a true copies of Provisional Specification and Complete Specification filed in respect of Patent Application No.895/MAS/2001, dated 01/04/2002 by T.ARVIND, H-24/6,VAIGAI STREET, Kalakshetra Colony, Besant Nagar,Chennai-600 090,Tamil Nadu, India, and Indian Citizen.

....

...In witness thereof

I have hereunto set my hand

Dated this the 04th day of June, 2003
14th day of Jyaistha, 1925 (Saka)

(K.M. VISWANATHAN)
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FORM 2

THE PATENTS ACT, 1970

(39 OF 1970)

PROVISIONAL ~~COMPLETE~~ SPECIFICATION

T. Arvind

(See section 10)

ORIGINAL 895 MAS 2001 E 1 NOV 2001

"A SYSTEM FOR IMAGE COMPRESSION AND A METHOD TO EFFECT IMAGE COMPRESSION"

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INDIA

INDIAN CITIZEN

The following specification particularly describes the nature of the invention and the manner in which it is performed

Field of Invention :

This invention in general relates to computer orientated technology. That is to say this invention is orientated the field of image capturing technology. This invention further relates to manipulation data. More particularly this invention relates to compression of data. Especialy this invention relates to invention of repetition coded compression algorithm for image compression.

Accordingly the invention relates to the novel technology / technique in the field of data compression. This invention further relates to a novel process by which the aforesaid technology will be implemented. Further this invention covers a novel system by which aforesaid technology will be implemented.

Introduction:

Image compression is of vital importance and great significance in many practical applications. And to choose between Lossy compression and Lossless compression depends primarily on the application.

There are several compression techniques employed in both the types. Generally Huffman coding and other Source coding techniques are used. But Image data is a highly correlated one. So if it were possible to achieve some compression out of this property and then apply Huffman coding, the method would be very efficient.

Image Compression

Uncompressed multimedia (graphics, audio and video) data requires considerable storage capacity and transmission bandwidth. Despite rapid progress in mass-storage density, processor speeds, and digital communication system performance, demand for data storage capacity and data-transmission bandwidth continues to outstrip the capabilities of available technologies. The recent growth of data intensive multimedia-based web applications have not only sustained the need for more efficient ways to encode signals and images but have made compression of such signals central to storage and communication technology

The need for image compression :

An enormous amount of data is produced when a 2D light intensity function is sampled and quantised to create a digital image. In fact, the amount of data may be so great that it results in impractical storage, processing and communication requirement.

- In a video based CD ROM application, full motion video, at 30 fps and a 720 x 480 resolution generates data at 20.376 Mbytes/second. At this rate only 31 seconds can be stored on a 640 Mb CD ROM. Compression can increase the storage capacity to 74min for VHS grade quality.

- In most facsimile machines, the document is scanned and digitized. Typically, an 8.5 x 11 inch page is scanned at 200 dpi, thus resulting in 3.74 Mb. Transmitting this over a low cost 14.4kbps modem will require 5.62 minutes. With compression transmission can be reduced to 17 seconds. This result is substantial savings in transmission cost.

The figures in the table below show the qualitative transition from simple text to full-motion video data and the disk space, transmission bandwidth, and transmission time needed to store and transmit such uncompressed data.

Multimedia Data	Size/Duration	Bits/Pixel or Bits/Sample	Uncompressed Size (B for bytes)	Transmission Bandwidth (b for bits)	Transmission Time (using 28.8K Modem)
A page of text	11" x 8.5"	Varying resolution	4-8 KB	32-64 Kb/page	1.1 - 2.2 sec
Telephone quality speech	10 sec	8 bps	80 KB	64 Kb/sec	22.2 sec
Grayscale Image	512 x 512	8 bpp	262 KB	2.1 Mb/image	1 min 13 sec
Color Image	512 x 512	24 bpp	786 KB	6.29 Mb/image	3 min 39 sec
Medical Image	2048 x 1680	12 bpp	5.16 MB	41.3 Mb/image	23 min 54 sec
SHD Image	2048 x 2048	24 bpp	12.58 MB	100 Mb/image	58 min 15 sec
Full-motion Video	640 x 480, 1 min (30 frames/sec)	24 bpp	1.66 GB	221 Mb/sec	5 days 8 hrs

The examples above clearly illustrate the need for sufficient storage space, large transmission bandwidth, and long transmission time for image, audio, and video data. At the present state of technology, the only solution is to compress multimedia data before its storage and transmission, and decompress it at the receiver for play back. For example, with a compression ratio of 32:1, the space, bandwidth, and transmission time requirements can be reduced by a factor of 32, with acceptable quality.

Now the description traces priorart technology, process and system. I t describes the inherent defects and short comings in technology. The object of invention is to over come the short comings in priorart technology. To this end this invention addresses to problems associated with priorart technology and comes out with effective solution by inventing a new technology. This is precise the object of the invention. The salient future of the invention is to investigate the problem inherent in the existing technology and invent a novel system process and technology.

Fundamentals of Image Compression

Compression is a process intended to yield a compact *digital representation* of a signal. In the literature, the terms *source coding, data compression, bandwidth compression* and *signal compression* are all used to refer to the process of compression. In the cases where the signal is defined as an image, a video stream, or an audio signal, the generic problem of compression is to minimize the bit rate of the digital representation. There are many applications that benefit when image, video and audio signals are available in compressed form. Without compression, most of these applications would not be feasible.

Image, video and audio signals are amenable to compression due to the following factors:

- There is considerable statistical redundancy in the signal.
    1. Within a single image or a single video frame, there exists significant correlation among neighbor samples. This correlation is referred to as *spatial correlation.*
    2. For data acquired from multiple sensors (such as satellite images), there exists significant correlation among samples

from these sensors. This correlation is referred to as *spectral correlation.*

3. For temporal data (such as video), there is significant correlation among samples in different segments of time. This correlation is referred to as *temporal correlation.*

- There is considerable information in the signal that is irrelevant from a perceptual point of view.
- Some data tend to have high-level features that are redundant across space and time, that is, the data is of a fractal nature.

Principle of novel technology:

In this Repetition Coded Compression algorithm, each element is compared with the previous element. If both of them are equal then a value of '1' is stored in a Bit-plane. Otherwise a value of '0' is stored in the Bit-plane. This different value which is represented by a '0' in the Bit-plane is only stored in a separate matrix instead of storing all the repeating values.

Objects of Invention :

It is the primary object of invention to invent a novel technology for image compression.

It is another object of invention to invent a novel process for image compression.

It is yet another object of invention to invent a novel system configuration for effectively implementing the process and the technology.

Further objects of the invention will be clear from the ensuing description.

Now the invention will be described in the following complete specification. The nature of invention and manner in which the invention is to be performed is clearly described in the following complete specification. The invention his described in detail with reference to drawings which accompany this complete specification.

Statement of Drawings :

The statement of figures of the drawings is as follows.

Figures 1 of drawing showers in block diagram of the RCC System for Hardware Implementation.

Figures 2 of drawing showers in block diagram of the RCC System for Software Implementation.

Figures 3 & 4 of drawing shower the out put display the effect of data compression.

Detailed Description of Proffered embodiment of Invention :

Now the invention describes the technology, process and system in respect of the invention.

Compression Algorithm:

The whole algorithm is a process for fast, efficient and absolutely lossless compression of image data. This is mainly based upon the numerous numbers of repetitions of the intensity values that occur in most of the images. Such repetitions are coded in a unique manner so as to achieve effective compression of the data size. The process is absolutely lossless. But in case when a lossy compression would be sufficient, Repetition coded compression can be modified to be lossy, so as to achieve more compression. The main advantages of this entire process is that, it is fast, effective, absolutely easy to implement and does not involve any complex transformations or mathematical computations. It is a unique and novel logical formula that achieves very good compression of highly correlated image data.

2-D REPETITION CODED COMPRESSION ALGORITHM

In **1-D RCCA** (REPETITION CODED COMPRESSION ALGORITHM) Method only one bit-plane is used to code the repetition in the horizontal direction. That is, the repetitions are coded uniquely when we move from left to right direction in an assumed image data matrix. This movement is very similar to the type of interlaced movement of the conventional video camera.

But in **2-D RCCA** (REPETITION CODED COMPRESSION ALGORITHM) method, two bit-planes are used to code the repetitions in both the horizontal and the vertical directions. Vertical direction indicates the movement from top to bottom along a single column in an image data matrix. This 2-D method is more efficient and gives a better compression ratio because, it takes into account, the repetitions occurring in both the horizontal as well as vertical directions.

The repetitions in both the directions are uniquely combined so as to achieve the maximum possible compression.

LOSSY REPETITION CODED COMPRESSION ALGORITHM

In this method, if the difference between the adjacent values is less then a Threshold, then the present value is replaced by the previous value. By this method the number of repetitions occurring in the image is increased.

So after performing 2-D LRCCA the compression is increased further. But this is achieved only at the expense of some loss in quality of the image.

The images for different values of Threshold are shown with the corresponding compression values.

POSSIBLE APPLICATIONS:

This process of Repetition coded compression can be applied in a wide variety of applications which deals with images, either in the stationary form or as a continuous motion picture.

It would be ideally suited for applications that demand a perfectly lossless compression. Some possible applications could be in the field of Medical imaging, where a lot of analysis is done on the images. Hence a perfect quality of images is to be ensured.

It can also be used for Remote sensing and mapping applications. Also pictures to be transmitted from satellites could be compressed using this simple method to ensure high data transfer rates and lesser costs.

The other variation of repetition coded compression which is lossy in nature finds itself extremely useful for many entertainment applications. This can include basic ones like compression of still-camera images to advanced applications like compression of motion pictures from video cameras.

Extension of Technology:

- The coded data can be further compressed by Huffman compression.
- The coded data matrix can be analyzed by applying various transforms like DCT and HAAR to check the possibility for further compression.

Repetition Coded Compression for higher order dimention:

So far, RCC has been implemented only for 1-Dimension i.e., along horizontal direction and 2-Dimension, i.e., along both horizontal and vertical directions.

The compression ratio achieved for 2-D RCC is much higher than 1-D RCC.

Proceeding in the same way, if RCC is extended to more than 2-D, i.e., along the diagonal directions, and further repetitions be coded using that, we could achieve much higher compression ratios than 1-D and 2-D RCC.

Such diagonal movement could be in four possible direction initially, and later be for theoretically infinite number of orientations.

RCC System description

The entire system for the implementation of RCC comprises of two variations.

1. Complete Software implementation
2. Hardware & Software implementation

In the first case, RCC algorithm can be implemented on a software platform, as a dynamic link library (DLL) and could be used 40 compress image files in the PC.

In the second variation, the entire code for RCC could be implemented on a FPGA (Field – Programmable Gate Array), Hardware Chip.

This chip could be integrated with digital still – cameras or motion cameras. The resulting compressed data could be stored in a suitable storage medium based on the application.

It is to be noted thus compression of the image data is achieved using Repetition Coded Compression Algorithm. This algorithm is easy to implement and is very fast as it does not make use of any complex transform techniques. The real advantage is that, this method can be used for any type of image file. Here the algorithm is applied only for Grayscale images. But in future it can be applied to color images also. The process of data compression using the technology of repetition coded compression is very effective. The novel process leads to lossless compression of image data. The system is versatile in it application and effectively carry out the technology and process of repetition coded compression.

Dated this 20th Day of October 2001.

T. Arvind

Signature of Applicant.

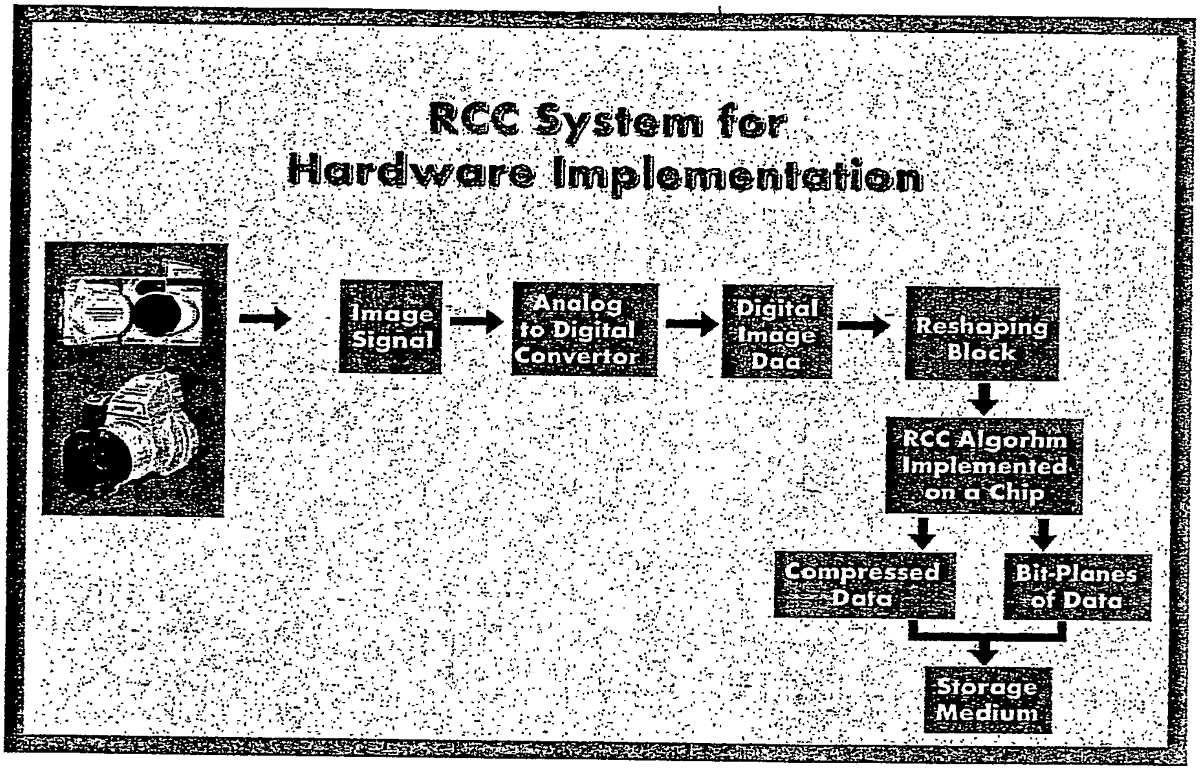

Figure 1

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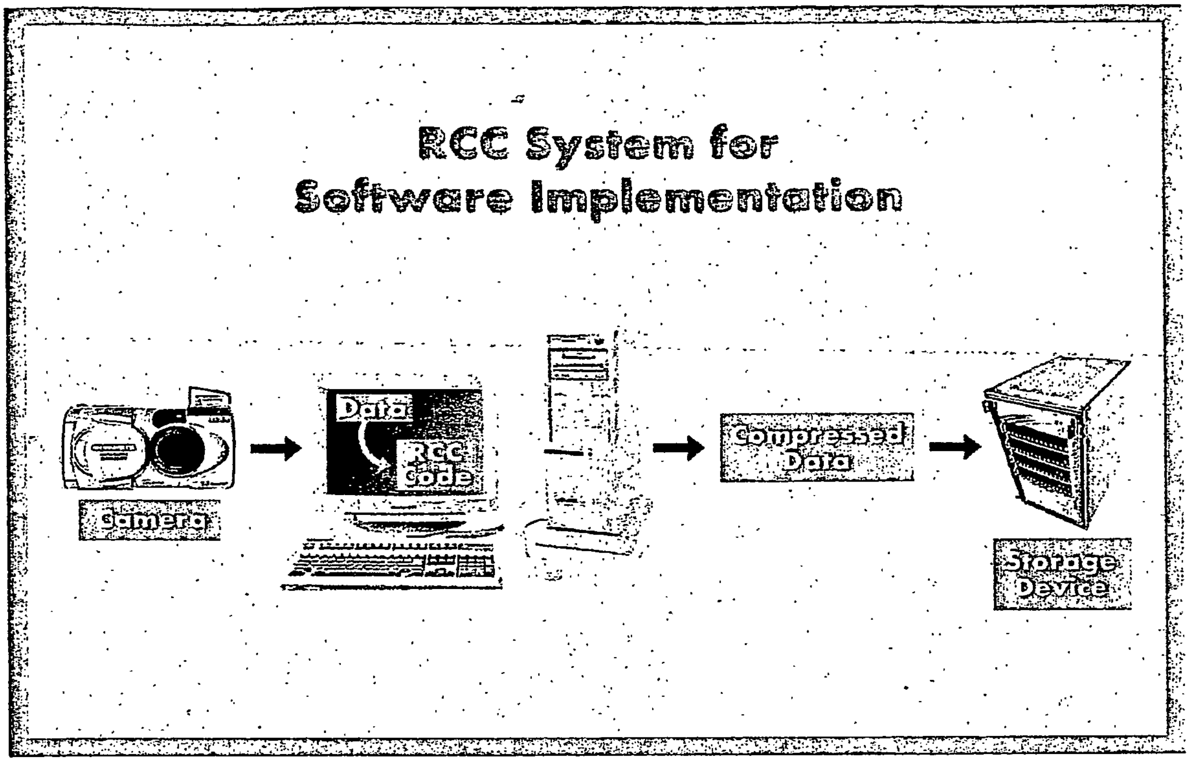

Figure 2

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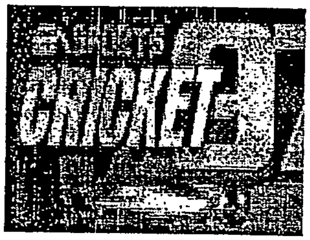
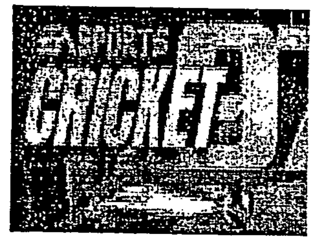
ORIGINAL IMAGE
SIZE :10878 bytes



THRESHOLD=10
SIZE :3658.5 bytes

THRESHOLD=20
SIZE :3132.5 bytes

THRESHOLD=30
SIZE :3010.5 bytes



THRESHOLD=40
SIZE :2913.5 bytes

THRESHOLD=50
SIZE :2898.5 bytes

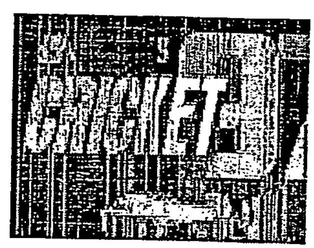


Figure 3

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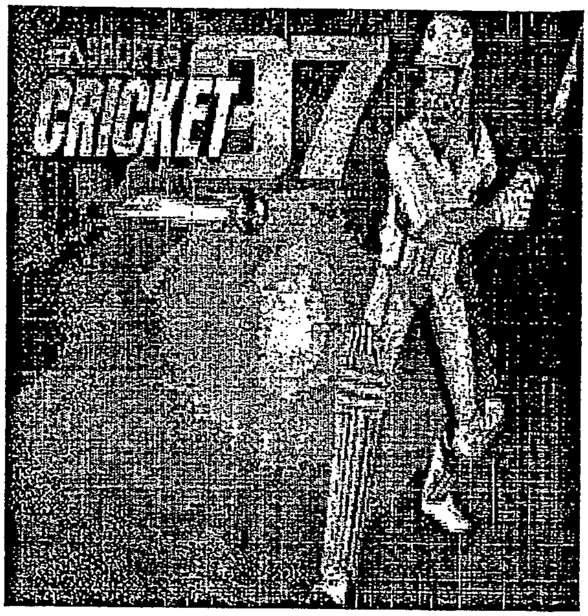
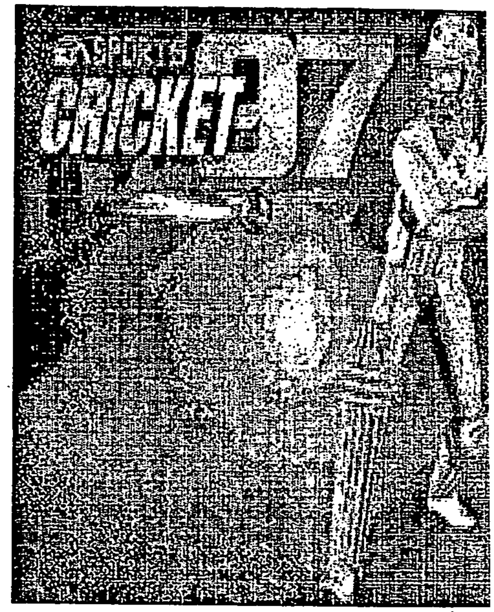
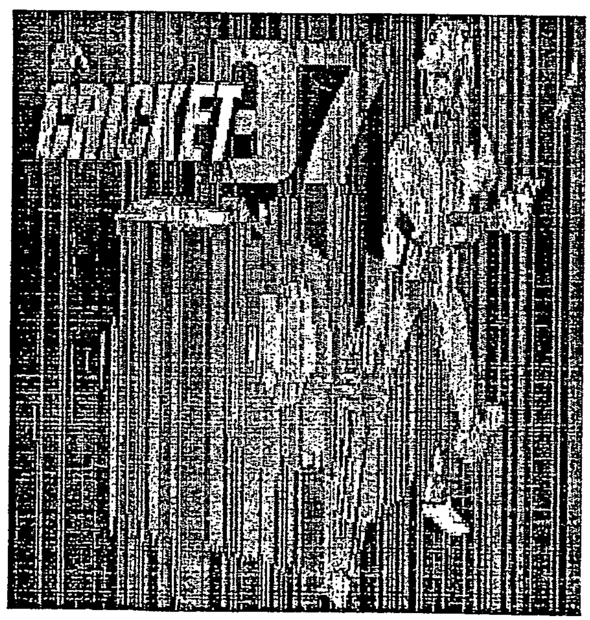


ORIGINAL IMAGE
SIZE: 56000 bytes



THRESHOLD = 20
SIZE:15926 bytes



THRESHOLD=4
SIZE:14479 bytes

Figure 4

T. Arvind
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FORM 2

THE PATENTS ACT 1970

COMPLETE SPECIFICATION

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The following specification describes the nature of the invention and manner in which the invention is to be performed

REPETITION CODED COMPRESSION

FIELD OF INVENTION

The present invention relates to a method and system of compressing image data and other highly correlated data streams.

BACKGROUND OF INVENTION

Image and data compression is of vital importance and has great significance in many practical applications. And to choose between Lossy compression and Lossless compression depends primarily on the application.

Some applications, where an automatic analysis is done on the image or data, using algorithms, require a perfectly lossless compression scheme so as to achieve zero errors in the automated analysis.

Generally Huffman coding and other Source coding techniques are used to achieve lossless compression of image data.

In certain other applications, the human eye visually analyzes images. Since the human eye is insensitive to certain patterns in the images, such patterns are discarded from the original images so as to yield good compression of data. These schemes are termed as 'Visually Lossless' compression schemes. This is not a perfectly reversible process. In other words, the de-compressed image data is different from the original image data. The degree of difference depends on the quality of compression and also the compression ratio.

Compression schemes based on Discrete Cosine Transforms and Wavelet Transforms followed by Lossy Quantization of data are typical examples of visually lossless scheme.

As a general rule, it is desirable to achieve the maximum compression ratio with zero or minimum possible loss in the quality of the image. At the same time, the complexity involved in the system and the power consumed by the image compression system are very critical parameters when it comes to a hardware based implementation.

Usually, the image compression is carried out in two steps. The first step is to use a pre-coding technique, which is mostly based on signal transformations; the second step would be to further compress the data values by standard source coding techniques like Huffman and Lempel-Ziv schemes. The initial pre-coding step is the most critical and important operation in the entire image compression scheme. The complexity involved with DCT and Wavelet based transformations is very high because of the huge number of multiplications involved in the operations. This is illustrated in the following equation.

$$DCT(i,j) = \frac{1}{\sqrt{2N}} C(i)C(j) \sum_{x=0}^{N-1} \sum_{y=0}^{N-1} f(x,y) \cos\left[\frac{(2x+1)i\pi}{2N}\right] \cos\left[\frac{(2y+1)j\pi}{2N}\right]$$

where $C(x) = \frac{1}{\sqrt{2}}$ if $x = 0$, else 1 if $x > 0$.

In addition to the huge number of multiplications involved in carrying out the above DCT equation, there also happens to be a zigzag rearrangement of the image data, which involves additional complexity. This clearly proves that the above mentioned conventional schemes for image compression are not very well suited for hardware based implementation.

So, the real requirement is a image compression system which does not involve any rigorous transforms and complex calculations. It also has to be memory efficient and power efficient. The present invention called as Repetition Coded Compression (RCC) is ideally suited for the above mentioned requirements. It is based on a single mathematical operation and requires zero multiplications for its implementations. This results in great amount of memory efficiency, power efficiency and speed in performing the compression. Because of the single mathematical operation involved for implementation of the present invention, the system is perfectly reversible and absolutely lossless. This is very important for many applications, which demand zero loss. The compression ratios are significantly higher than the existing lossless compression schemes. But if the application permits a lossy compression system, the present invention can also cater to the lossy requirements. In this case a slight modification is done to the mathematical operation so that certain amount of loss is observed in the compression and thereby resulting in much higher compression ratios. This lossy compression system would find great applications in entertainment and telecommunication systems.

SUMMARY OF INVENTION

Image data is a highly correlated one. This means that, the adjacent data values in an image are repetitive in nature. So, if it is possible to achieve some compression out of this repetitive property of the image and then apply Huffman coding or other source coding schemes, the method would be very efficient.

In this Repetition Coded Compression algorithm, each element is compared with the previous element. If both of them are equal then a value of '1' is stored in a Bit-plane. Otherwise a value of '0' is stored in the Bit-plane. This different value is only stored in a matrix instead of storing all the repeating values.

In one-dimensional RCC Method only one bit-plane is used to code the repetition in the horizontal direction.

But in two-dimensional RCC method, two bit-planes are used to code the repetitions in both the horizontal and the vertical directions. This is more efficient and gives a better compression ratio.

This clearly proves that the compression system is implemented without any multiplications and complex transformations. It is purely based on a mathematical comparison of adjacent image data values. The comparison is performed between adjacent image data values in both the horizontal as well as vertical directions. The bit-planes formed as a result of the above-mentioned comparison in the horizontal and vertical directions are respectively combined by a binary addition method. After this the resultant bit-plane positions are called as RCC bit-planes. The zero values in the RCC bit-plane are the only ones that are to be stored for lossless reconstruction of the original image. Such values corresponding to the same locations in the original image matrix as zeros in the RCC bit-plane are called as RCC data values. All the other image data values can be reconstructed by using the RCC data values and the horizontal, vertical bit-planes.

In case of a lossy system of implementation, the adjacent pixels are not only compared for repetition, but also for the difference value. If the difference value between adjacent pixels is lesser than a given arbitrary threshold value, then the two adjacent pixels are made as the same. This further increases the number of repetitions in the image data and therefore also increases the compression ratio after Repetition Coded Compression is applied. The value of the threshold can be varied according to the requirements of the particular application and system. The higher the threshold, the better the compression ratio and also higher loss in the quality of the reconstructed image.

BRIEF DESCRIPTION OF FIGURES

Figure - 1

This figure illustrates the entire image compression system based on Repetition Coded Compression on a hardware implementation. The raw analog image signals are captured by the camera and are converted into respective digital data by a analog to digital converter. This digital data is rearranged into a matrix of image data values by a reshaping block. The reshaped image matrix is given to the embedded chip, which performs the entire RCC system. This therefore gives the compressed RCC data values and also the bit-planes for storage, archival and future retrieval.

Figure - 2

This is a sample image of the human brain, which is captured by magnetic resonance imaging (MRI), and this sample image would be used to demonstrate the compression achieved by Repetition Coded Compression system. It is a grayscale image.

Figure - 3

This zooms a small region from the sample MRI image of the human brain. This zoomed region would be used for demonstrating the compression system.

Figure - 4

This shows that the image is made up of lot of pixels in grayscale.

Figure - 5

This shows a 36-pixel region within the sample MRI image of the human brain.

Figure - 6

This shows the ASCII value equivalent of the image data values, which are originally used for data storage. Each value requires eight bits of data memory or in other words 1 byte of data memory. Currently the 36-pixel region requires about 288 bits or 36 bytes of data memory. It would later be demonstrated that the data could be compressed and stored with only 112 bits.

Figure - 7

This shows the application of Repetition Coded Compression along the Horizontal Direction in the Image Matrix. This results in the Horizontal bit-plane and also the horizontal values stored.

Figure - 8

This shows the application of Repetition Coded Compression along the Vertical Direction in the Image Matrix. This result in the Vertical bit-plane and also the vertical values stored.

Figure - 9

This shows the combination of Horizontal and Vertical bit-planes by a binary addition operation thereby resulting in only five zero values which correspond to the final values store from the original image matrix.

Figure - 10

This shows the total memory required for the 36-pixel region before and after applying repetition coded compression. The original memory requirement was 288 bits. After applying Repetition Coded Compression the memory required was 112 bits. This proves a great amount of compression achieved.

Figure - 11

This shows the application of Repetition Coded Compression to the entire image and the size is compressed to 44,000 bits from the original 188,000 bits.

Figure - 12

This shows the complete principle for implementation of Repetition Coded Compression. The image matrix is encoded along the horizontal and vertical directions and the respective bit-planes are derived. Further compression is achieved by combining the horizontal and vertical bit-planes by a binary addition operation. This results in the RCC bit-plane, which is logically inverted and compared with the original image matrix to obtain the final RCC data values. These RCC data values along with the Horizontal and Vertical bit-planes are stored in the data memory for archival and future retrieval.

DETAILED DESCRIPTION OF INVENTION

Image data is a highly correlated one. This means that, the adjacent data values in an image are repetitive in nature. So, if it is possible to achieve some compression out of this repetitive

property of the image and then apply Huffman coding or other source coding schemes, the method would be very efficient.

In this Repetition Coded Compression algorithm, each element is compared with the previous element. If both of them are equal then a value of '1' is stored in a Bit-plane. Otherwise a value of '0' is stored in the Bit-plane. This different value is only stored in a matrix instead of storing all the repeating values.

In one-dimensional RCC Method only one bit-plane is used to code the repetition in the horizontal direction.

But in two-dimensional RCC method, two bit-planes are used to code the repetitions in both the horizontal and the vertical directions. This is more efficient and gives a better compression ratio.

This clearly proves that the compression system is implemented without any multiplications and complex transformations. It is purely based on a mathematical comparison of adjacent image data values. The comparison is performed between adjacent image data values in both the horizontal as well as vertical directions. The bit-planes formed as a result of the above-mentioned comparison in the horizontal and vertical directions are respectively combined by a binary addition method. After this the resultant bit-plane positions are called as RCC bit-planes. The zero values in the RCC bit-plane are the only ones that are to be stored for lossless reconstruction of the original image. Such values corresponding to the same locations in the original image matrix as zeros in the RCC bit-plane are called as RCC data values. All the other image data values can be reconstructed by using the RCC data values and the horizontal, vertical bit-planes.

In case of a lossy system of implementation, the adjacent pixels are not only compared for repetition, but also for the difference value. If the difference value between adjacent pixels is lesser

than a given arbitrary threshold value, then the two adjacent pixels are made as the same. This further increases the number of repetitions in the image data and therefore also increases the compression ratio after Repetition Coded Compression is applied. The value of the threshold can be varied according to the requirements of the particular application and system. The higher the threshold, the better the compression ratio and also higher loss in the quality of the reconstructed image.

Figure – 1 illustrates the entire image compression system based on Repetition Coded Compression on a hardware implementation. The raw analog image signals are captured by the camera and are converted into respective digital data by a analog to digital converter. This digital data is rearranged into a matrix of image data values by a reshaping block. The reshaped image matrix is given to the embedded chip, which performs the entire RCC system. This therefore gives the compressed RCC data values and also the bit-planes for storage, archival and future retrieval. Figure – 2 is a sample image of the human brain which is captured by magnetic resonance imaging (MRI) and this sample image would be used to demonstrate the compression achieved by Repetition Coded Compression system. It is a grayscale image. Figure – 3 zooms a small region from the sample MRI image of the human brain. This zoomed region would be used for demonstrating the compression system. Figure – 4 shows that the image is made up of lot of pixels in grayscale. Figure – 5 shows a 36-pixel region within the sample MRI image of the human brain. Figure – 6 shows the ASCII value equivalent of the image data values which are originally used for data storage. Each value requires eight bits of data memory or in other words 1 byte of data memory. Currently the 36-pixel region requires about 288 bits or 36 bytes of data memory. It would later be demonstrated that the data could be compressed and stored with only 112 bits. Figure – 7 shows the application of Repetition Coded Compression along the Horizontal Direction in the Image Matrix. This results in the

Horizontal bit-plane and also the horizontal values stored. Figure – 8 shows the application of Repetition Coded Compression along the Vertical Direction in the Image Matrix. This result in the Vertical bit-plane and also the vertical values stored. Figure – 9 shows the combination of Horizontal and Vertical bit-planes by a binary addition operation thereby resulting in only five zero values which correspond to the final values store from the original image matrix. Figure – 10 shows the total memory required for the 36-pixel region before and after applying repetition coded compression. The original memory requirement was 288 bits. After applying Repetition Coded Compression the memory required was 112 bits. This proves a great amount of compression achieved. Figure – 11 shows the application of Repetition Coded Compression to the entire image and the size is compressed to 44,000 bits from the original 188,000 bits. Figure – 12 shows the complete principle for implementation of Repetition Coded Compression. The image matrix is encoded along the horizontal and vertical directions and the respective bit-planes are derived. Further compression is achieved by combining the horizontal and vertical bit-planes by a binary addition operation. This results in the RCC bit-plane, which is logically inverted and compared with the original image matrix to obtain the final RCC data values. These RCC data values along with the Horizontal and Vertical bit-planes are stored in the data memory for archival and future retrieval.

The coded data can be further compressed by Huffman compression.

Thus compression of the image data is achieved using Repetition Coded Compression System. This
System is easy to implement and is very fast, as it does not make use of any complex transform techniques. The real advantage is that, this method can be used for any type of image file. Here the system is applied only for Grayscale images. But in future it can be applied to color images also.

In case of a lossy system of implementation, the adjacent pixels are not only compared for repetition, but also for the difference value. If the difference value between adjacent pixels is lesser than a given arbitrary threshold value, then the two adjacent pixels are made as the same. This further increases the number of repetitions in the image data and therefore also increases the compression ratio after Repetition Coded Compression is applied. The value of the threshold can be varied according to the requirements of the particular application and system. The higher the threshold, the better the compression ratio and also higher loss in the quality of the reconstructed image.

This system of Repetition Coded Compression of images can be applied to fields like Medical Image Archiving and Transmission, Database Systems, Information Technology, Entertainment, Communications & Wireless Applications, Satellite Imaging, Remote Sensing, Military Applications

CLAIMS

1. A system for compressing image and other highly correlated data comprising means for capturing the image, means for converting to digital form, means for reshaping the data, means for encoding the repetitions, means for storing the compressed data and means for retrieving the data.

2. A system for performing a single said mathematical operation for compressing image data and also with zero multiplication involved.

3. A system for encoding said repetitions along the said horizontal and said vertical directions.

4. A method of deriving said bit-planes containing information regarding the said repetitions along the said horizontal and said vertical directions.

5. A method of combining the said horizontal and said vertical bit-planes by a said binary addition operation to result in the said RCC bit-planes.

6. A method to compare the derived said RCC bit-planes with the said original image matrix to obtain the said final RCC data values.

7. A method to store and archive the said RCC data values along with the said horizontal and said vertical bit-planes.

8. A method to reconstruct the original image from the stored said RCC data values and the said bit-planes

9. A system to archive the compressed image data values and also to retrieve the same to reconstruct the original image.

10. A method of lossless compression of image data values.

11. A method of lossy compression by comparison with a said threshold value to achieve significantly higher compression ratio.

12. A system for implementation of the said compression method for various applications like Medical Image Archiving and Transmission, Database Systems, Information Technology, Entertainment, Communications & Wireless Applications, Satellite Imaging, Remote Sensing, Military Applications.

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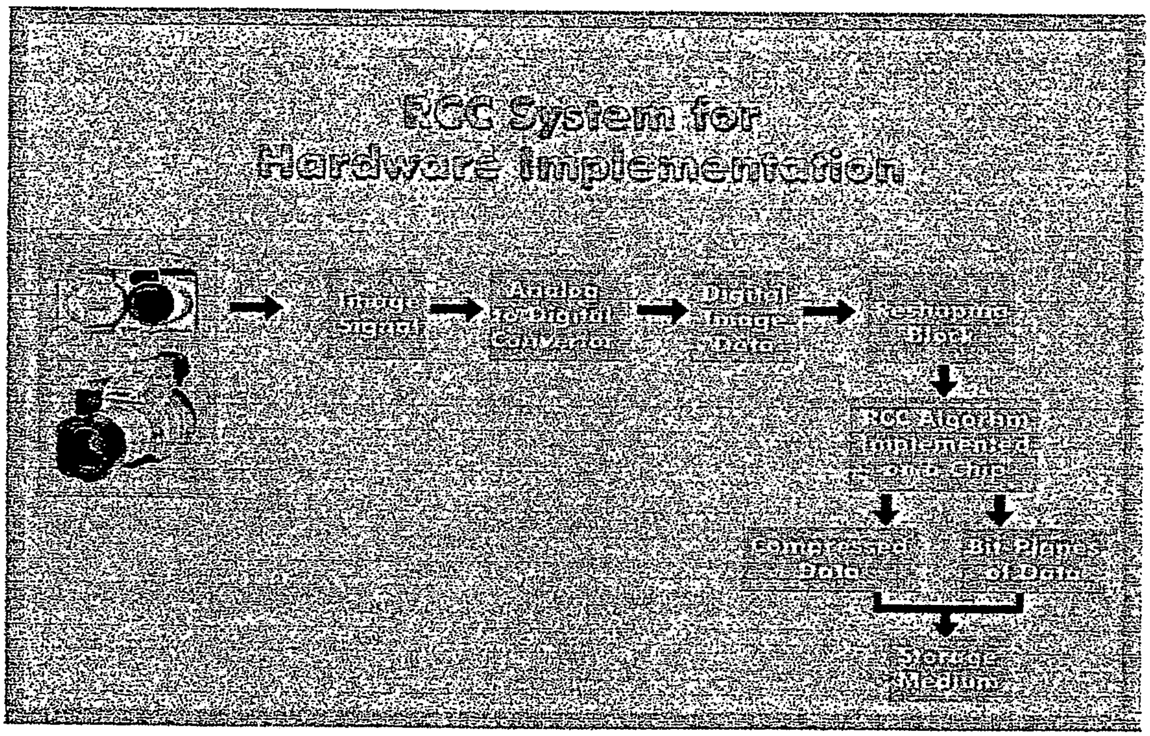
TOTAL SHEETS - 12
SHEET No. - 1

Figure - 1



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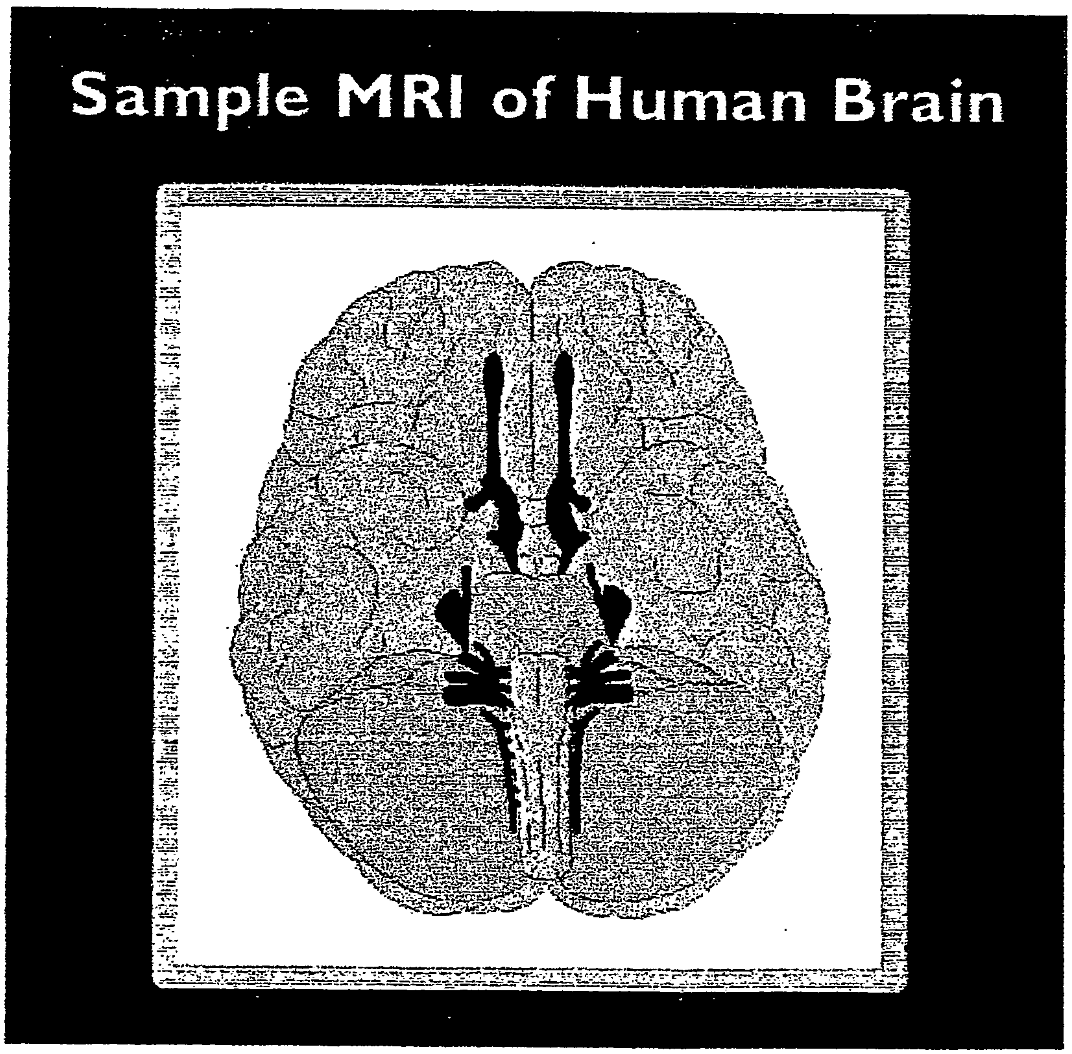
TOTAL SHEETS – 12
SHEET NO. – 2

Figure - 2



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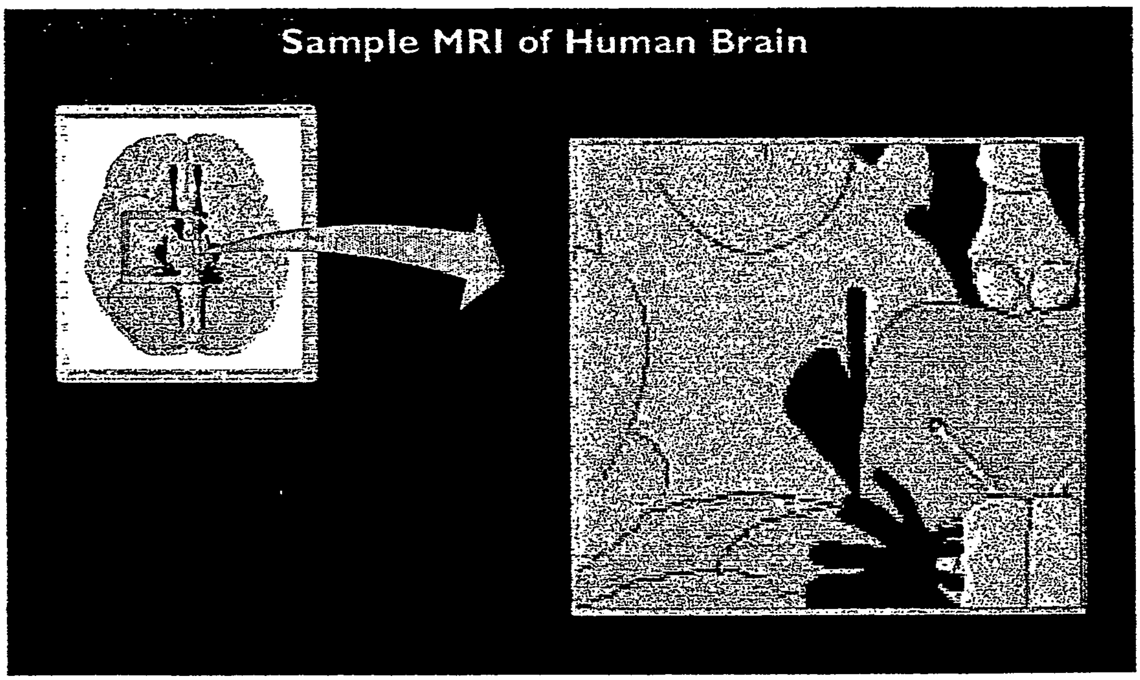
TOTAL SHEETS - 12
SHEET No. - 3

Figure - 3



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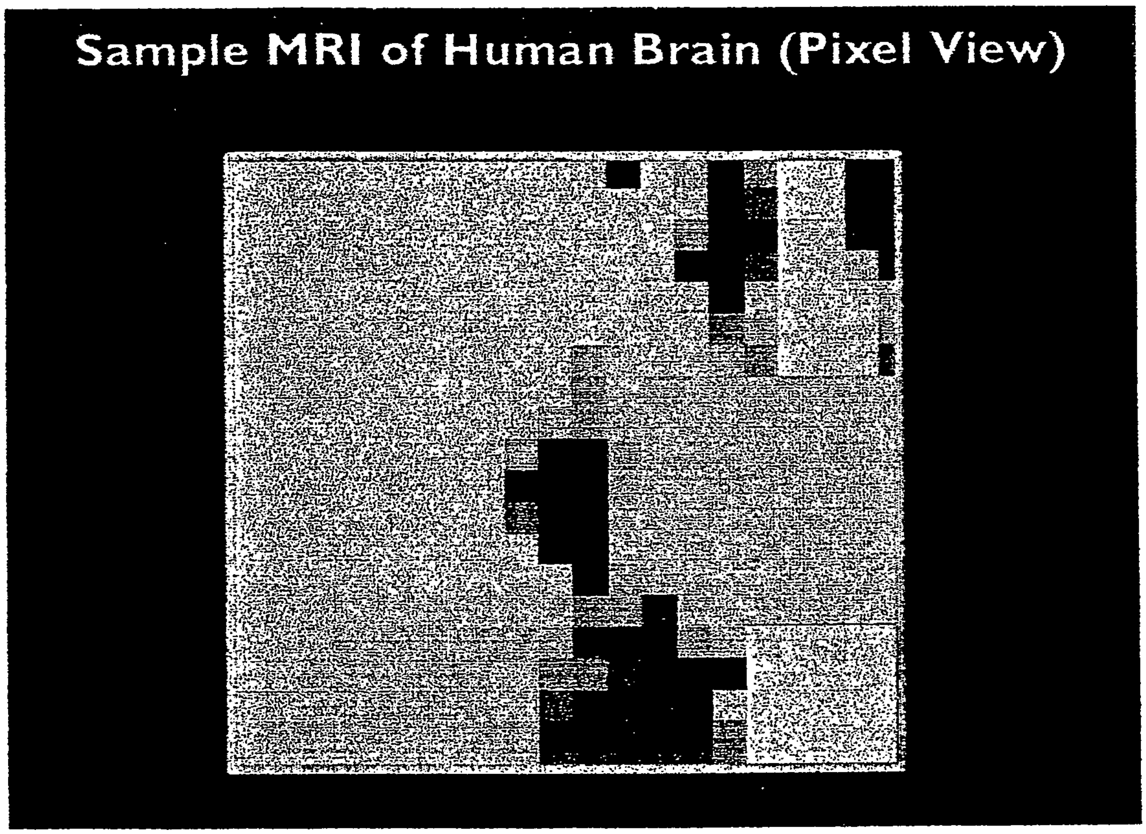
TOTAL SHEETS - 12
SHEET No: - 4

Figure - 4



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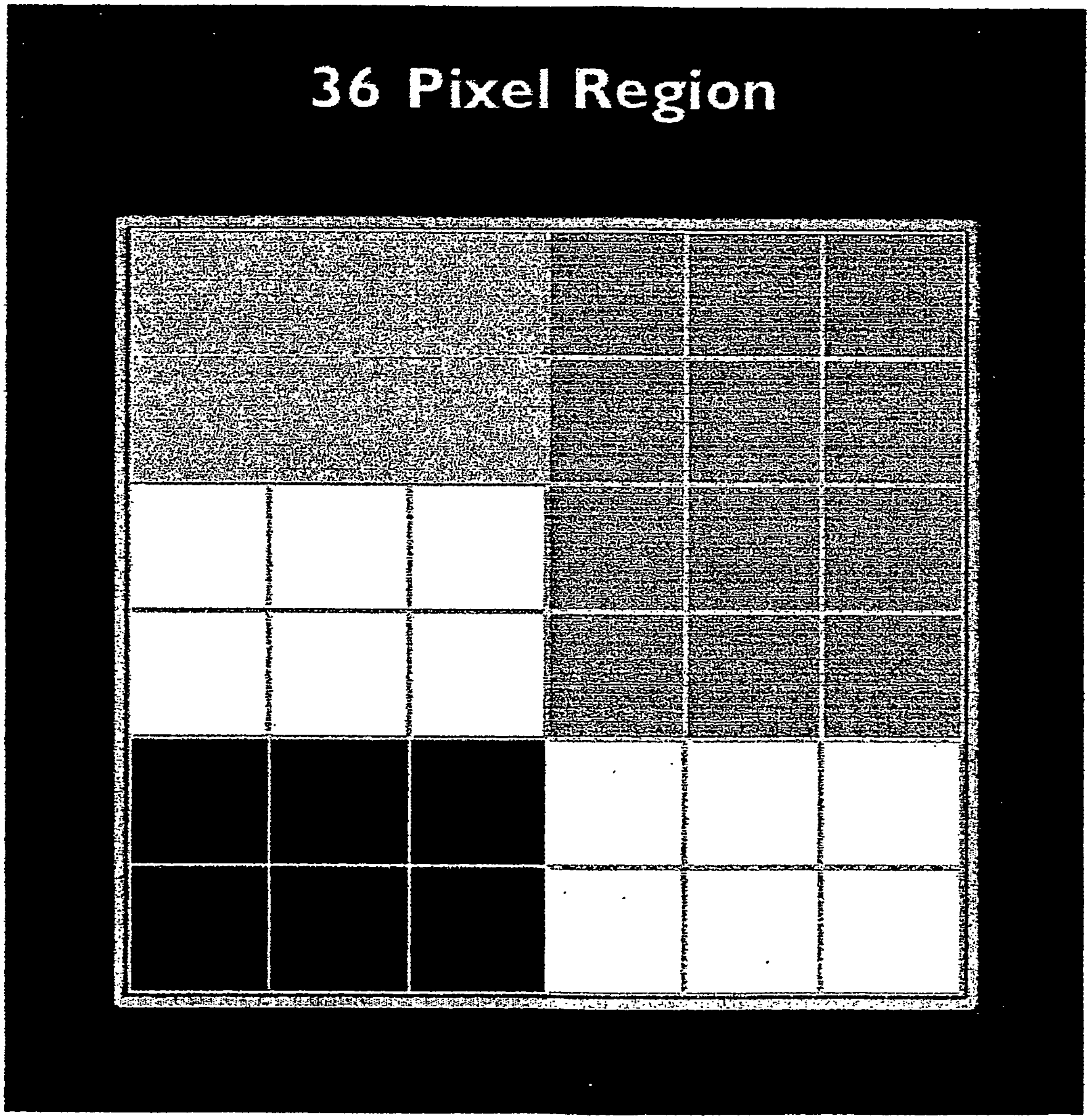
TOTAL SHEETS - 12
SHEET NO. - 5

Figure - 5



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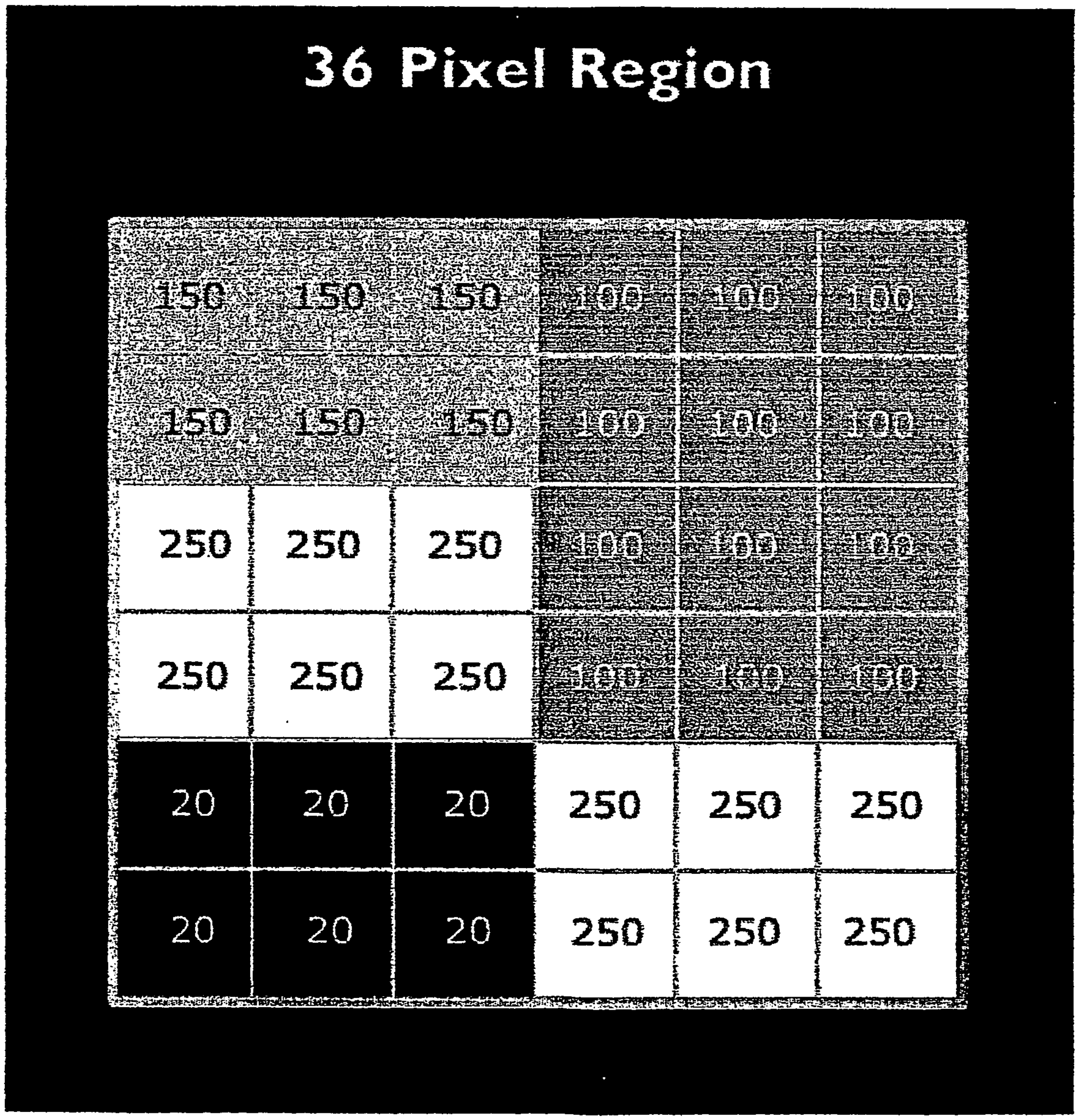
TOTAL SHEETS - 12
SHEET No. - 6

Figure - 6



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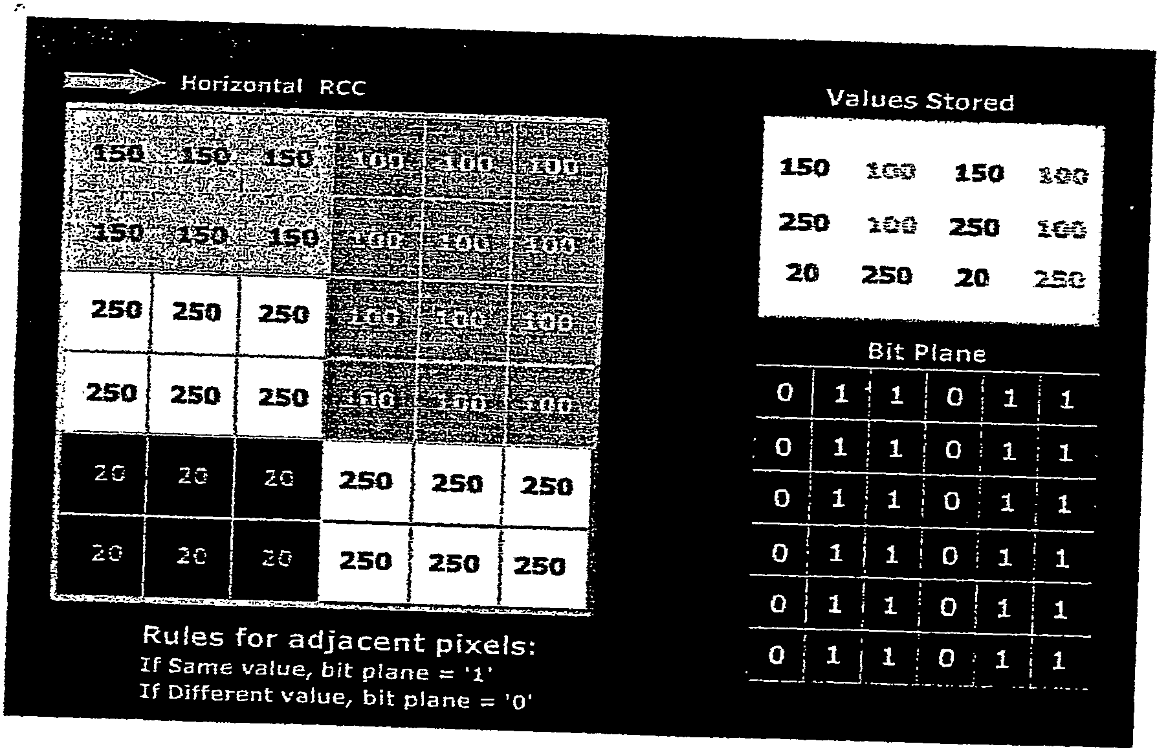
TOTAL SHEETS -
SHEET No. - 7

Figure - 7



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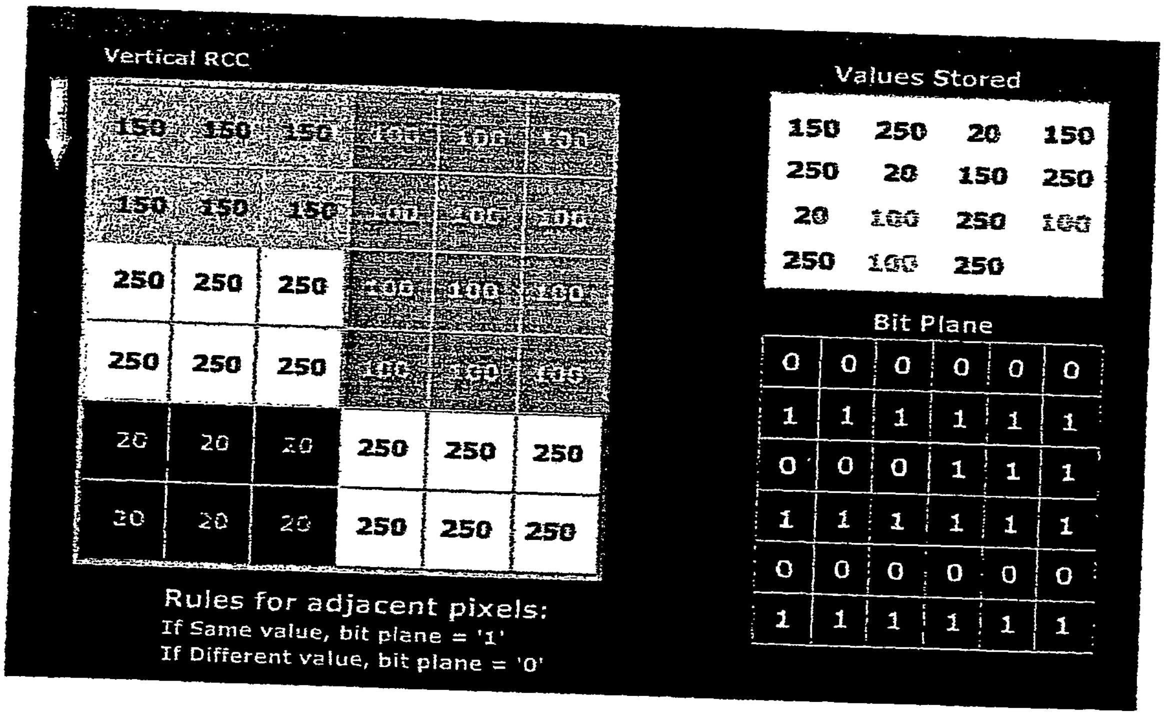
TOTAL SHEETS
SHEET No. – 8

Figure - 8



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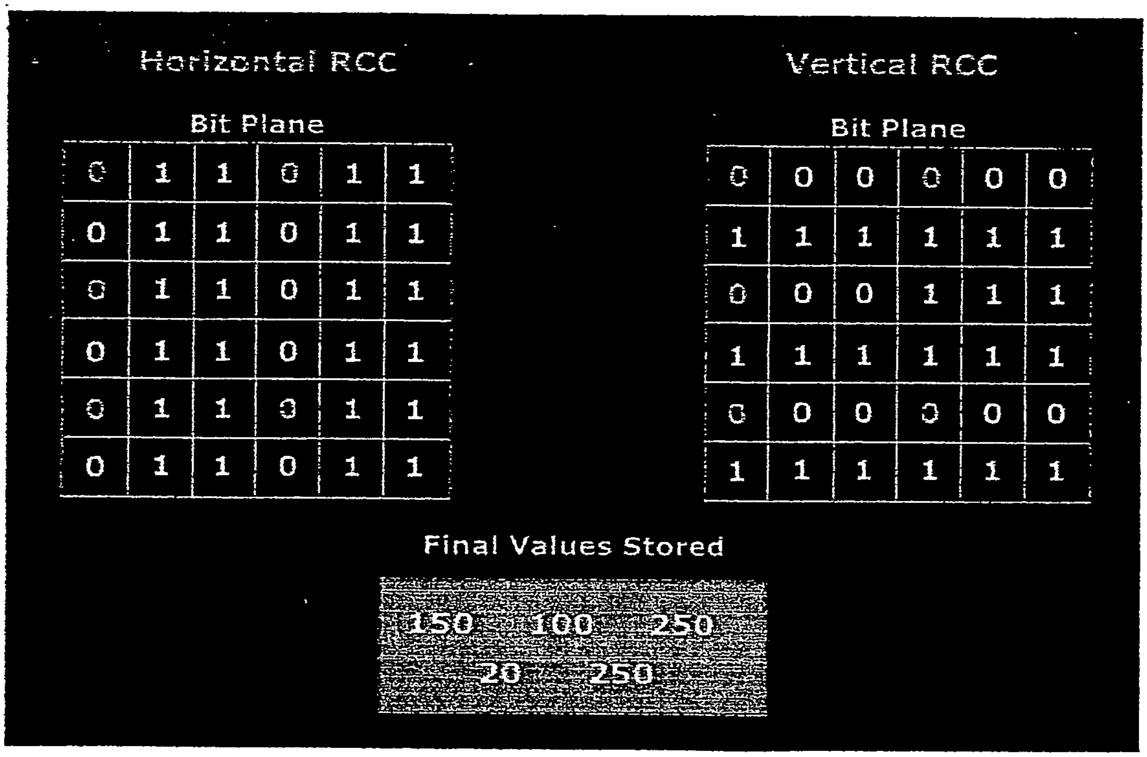
TOTAL SHEETS – 1
SHEET No. – 9

Figure - 9



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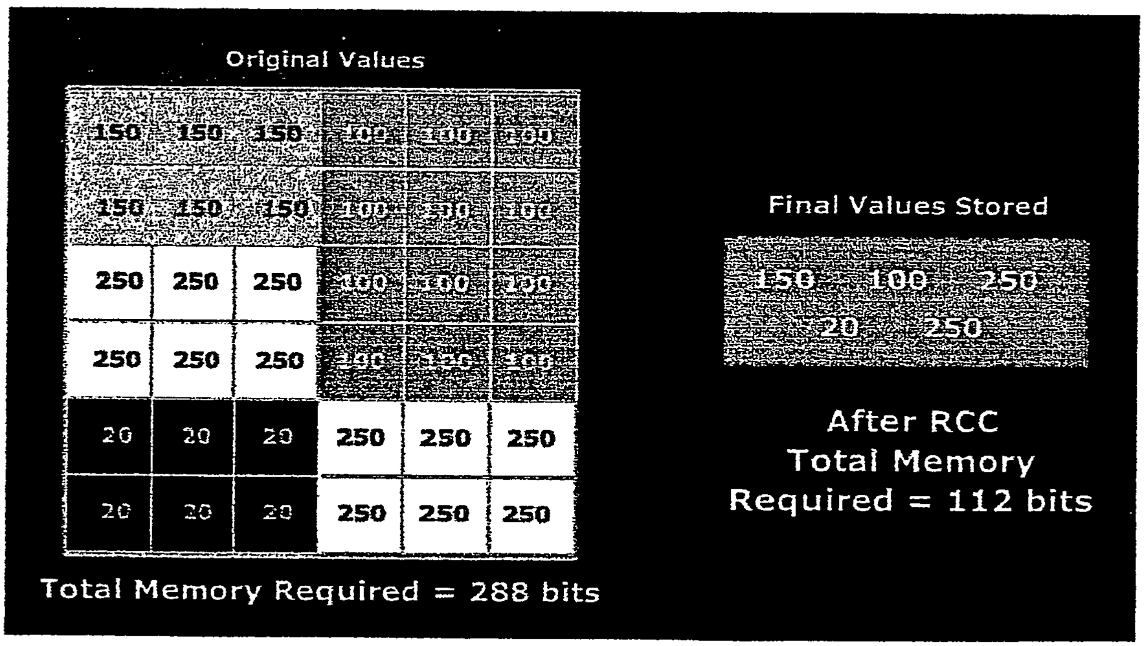
SHEET NO. - 10

Figure - 10



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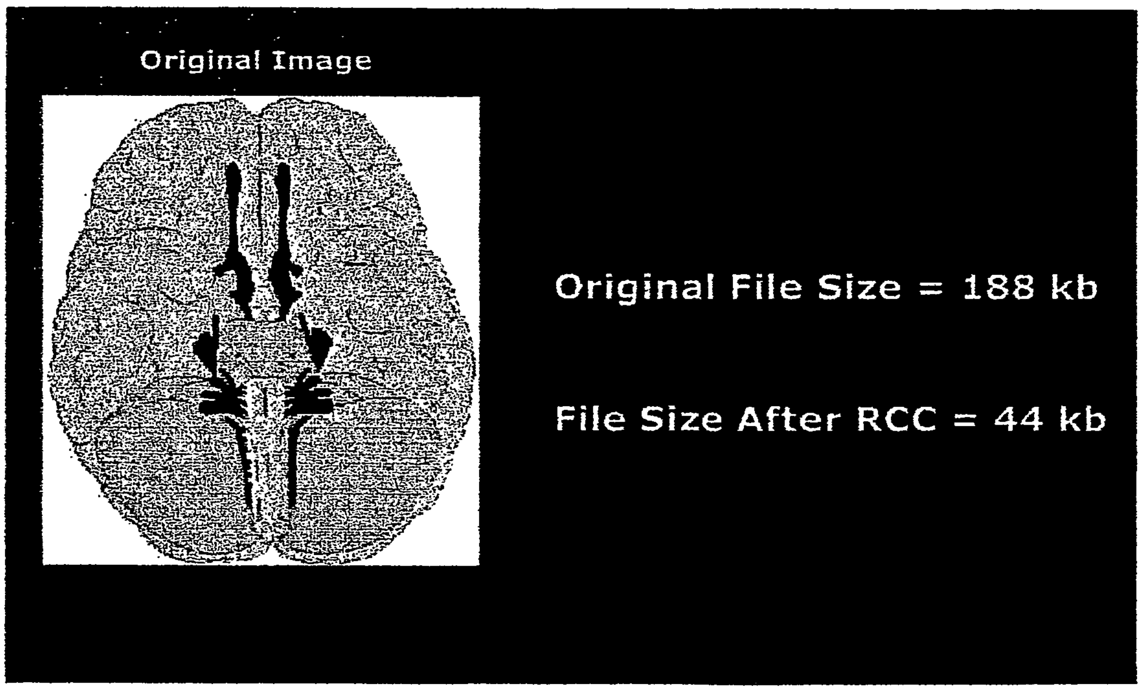
TOTAL SHEETS - 12
SHEET No. - 11

Figure - 11



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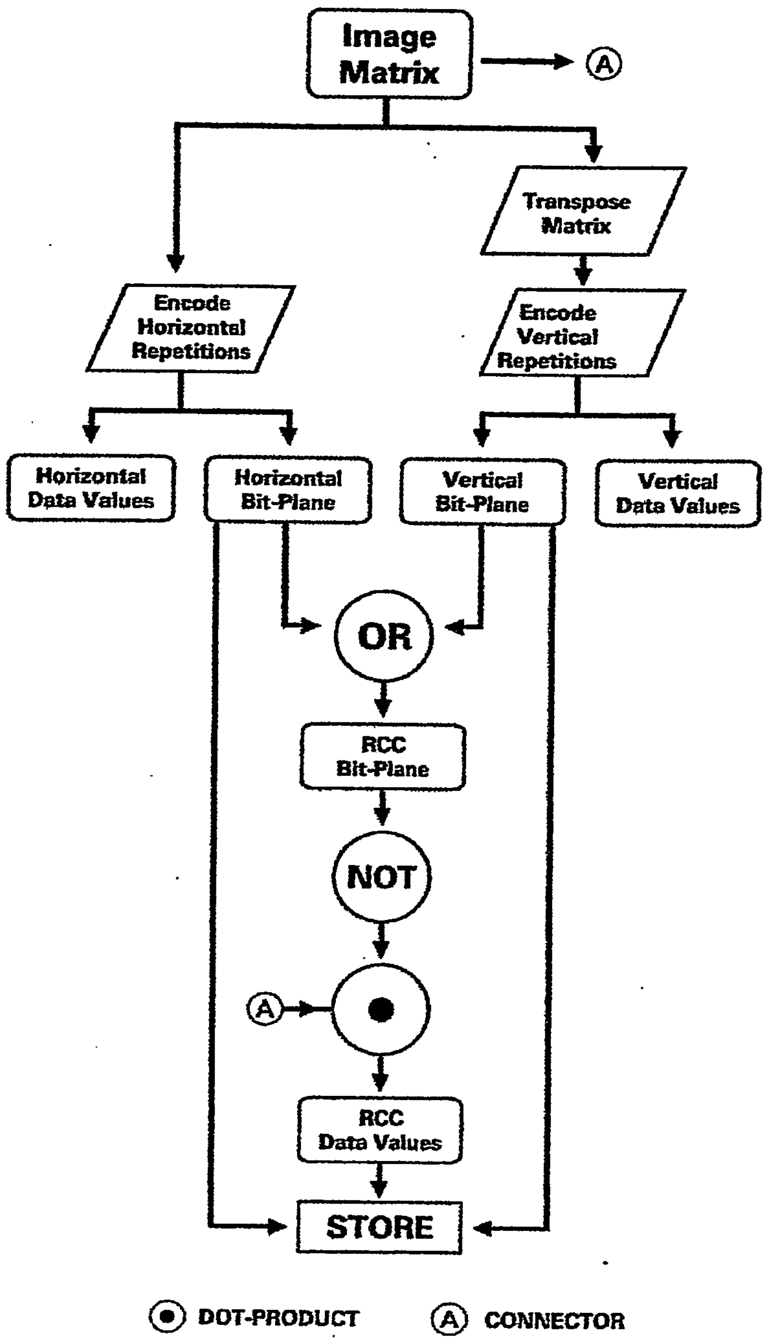
SHEET No. — 12

Figure - 12



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